A Marshall Cavendish Publication in weekly parts

Part 8

THE KNACK

The complete manual of DIY skills, projects and home ideas

It's easy when you've got the Knack

UK 80p Australia $1.75 NZ $1.95 Republic of Ireland £1 Singapore $3.95 Malta 70c South Africa R2.25

®

8

THE KNACK

Contents Volume 1 3rd Edition

Plumbing course 3 197

Bending copper pipe

A guide to one of the basic plumbing skills—easier to master than you might expect

Home designer 203

On reflection

How—and where—to use mirrors in the home
Project: Feature wall mirror

Project 210

Dig a garden pond

Put the sparkle and life that a pond brings into your garden

Masonry course 4 214

Making a breakthrough

All you need to know to do the job properly and safely
Project: Build a serving hatch

Woodwork course 5 220

Simple security

How to fit a mortise lock to your doors; how to identify the weak points in your house; how to secure windows

The Index
The last two parts of The Knack will form a fully cross-referenced Index. For easy access to the information in your growing collection, interim indexes will be published to cover each volume.

Note: We take great care to ensure that the information in The Knack is accurate. But because building regulations, local bylaws and the construction of existing houses vary so greatly, we can accept no responsibility for loss or damage caused by the misapplication of any instruction.

Note to readers in Australia, New Zealand, North America and Canada: Throughout The Knack, the correct technical terms, names of products and so on that apply in your country are given in brackets after their UK equivalents.

How to order your binders

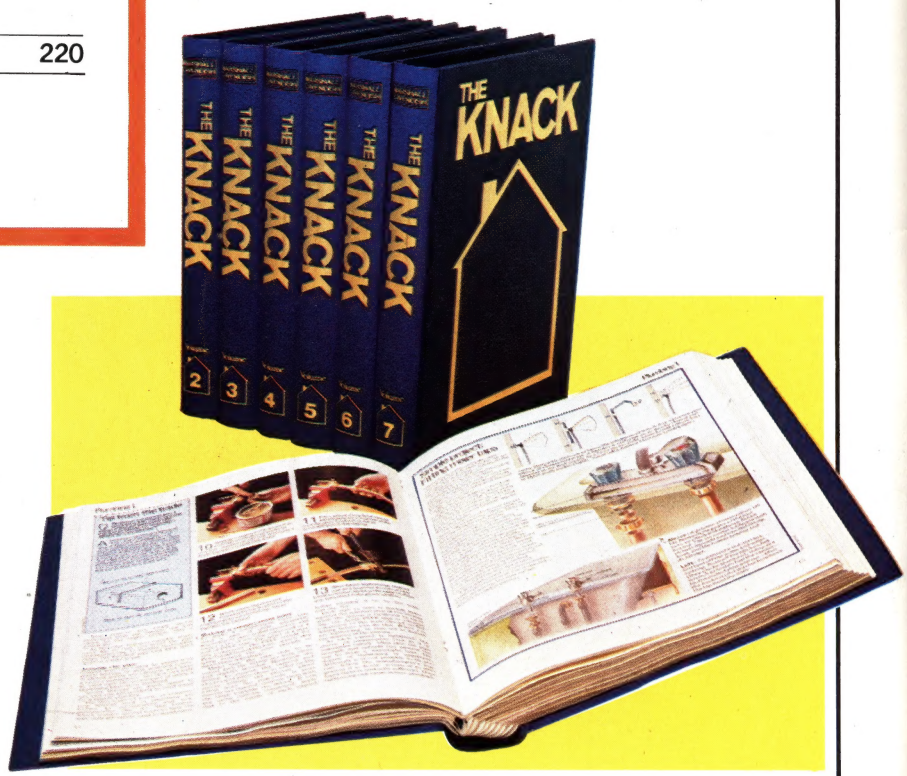
Each binder holds 14 parts.
UK and Republic of Ireland: Send £3.50 plus 70p postage and packing (IR £4.70p inclusive postage and packing) per binder to The Knack Binders, Dept TKO/1 Marshall Cavendish Services Ltd, Newtown Road, Hove, Sussex BN3 7DN. For customer services: Tel. Brighton 725591.
Australia: Binders are available from The Knack Binders, Gordon & Gotch Ltd, PO Box 213, Alexandria, New South Wales 2015.
New Zealand: Binders are available from The Knack Binders, Gordon & Gotch (NZ) Ltd. PO Box 1595, Wellington.
South Africa: Binders are available from any branch of CNA Ltd. In case of difficulty write to Republican News Agency, 31 Height Street, Doornfontein, Johannesburg, enclosing a postal order for the cost of each binder plus sales tax and 50c postage.
Malta: Binders are available from your newsagent.

Back Numbers

Copies of any weekly part of The Knack can be obtained from these addresses at the regular cover price.
UK and Republic of Ireland: The Knack Back Numbers, Dept. TK, Marshall Cavendish Services Ltd, Newtown Road, Hove, Sussex BN3 7DN.
Australia: Back numbers are available from your newsagent.
New Zealand: Back numbers are available from your newsagent.
South Africa: Back numbers are available from any branch of Central News Agency Ltd. In case of difficulty please write to Republican Newsagency, 31 Height Street, Doornfontein, Johannesburg, enclosing a postal order for the cover price (please add sales tax).
Malta: Back numbers are available from your newsagent.

Copies by post

Our subscription department can supply your copies direct to you regularly at 80p each. For example the cost of 26 issues is £20.80: for any other quantity simply multiply by 80p. Rates apply anywhere in the world. Send your payment to Subscription Department, Marshall Cavendish Partworks Ltd, 58 Old Compton Street, London W1V 5PA.

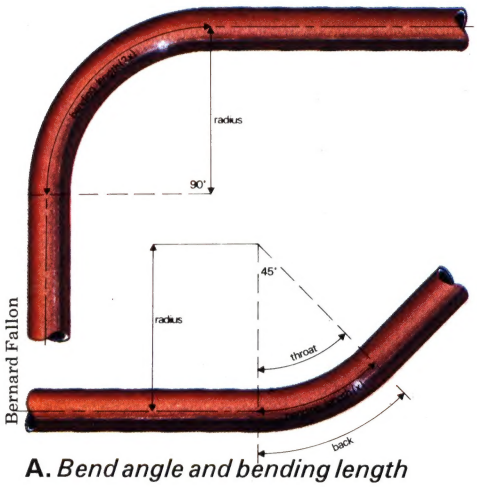


Published by Marshall Cavendish Partworks Ltd, 58 Old Compton Street, London W1V 5PA. © Marshall Cavendish Ltd 1981, 1982, 1984. Printed in England by Varnicoat, Worcester

Bending copper pipe

• Annealing copper piping for better bends • Use of a bending spring • Planning a pipework route • The technique of making flawless bends • Use of flexible hosing in place of fixed bends

Below: *A blowtorch, thick gloves, a bending spring of the correct diameter and a brick shield are the basic requirements for pipe bending*



A. *Bend angle and bending length*

If you are going to attempt much domestic plumbing, sooner or later you will need to make bends in copper piping. Indeed, one of the advantages of using copper piping is the ease with which it is worked. But while the techniques of bending copper piping are not difficult to master, considerable care is required in the planning stages: even when making bends presents no problems, it is often easier to make use of standard shaped capillary fittings or compression joints.

All domestic copper pipe sizes can be bent by hand, one way or another —each with varying success. Special bending tools are recommended for the larger bore tubing if the pipe is not to be flattened as it is bent.

Straight tubing has a wall whose opposite faces are always parallel— and which must remain so even after bending if the true round section across the tube is to be maintained. Some distortion, however, takes place on both the outside and the inside walls of the pipe as it is bent. The outside wall (or 'back') of the bend is stretched and the inside (or 'throat') of the bend is compressed slightly.

The forces involved in bending a section of copper piping will cause the tube to collapse and flatten unless precautions are taken. This means providing some form of internal support unless the stretching force is spread along the bend section length —as happens when a *pipe-bending machine* is used.

Use a *bending spring* to provide the necessary internal support if the pipe is being bent by hand. The diameter of this inexpensive item is matched exactly to a specific tube size, so a set may be required if a variety of pipework sizes are being used. Fine sand, compacted and sealed in place with a stuffed rag or cork, is a cheap and surprisingly effective alternative.

Use of a pipe-bending spring, on its own, does not guarantee success in pipe bending, however. Repeated heating and cooling (annealing) of the bend section (even with 'half-hard' tube) is often necessary to perfect the bend.

Annealing copper tube makes it easier to bend and is done by heating the pipe to a dull cherry-red glow and then cooling it rapidly in a water bath or by pouring water over it. An oven of sorts can be formed using a few firebricks arranged to concentrate the blowlamp heat (fig. 3).

Anneal only the section of piping to be bent—this improves the chances of making a good bend exactly where you would like to have one.

Handle annealed tubing a little more carefully than untreated pipe. The slightest indent makes fitting a bending spring impossible and the correct use of a bending machine difficult. If a badly-made bend occurs in a long pipe run, cut it off and start a new section, joining the two with a capillary joint.

Coarse pipework routes

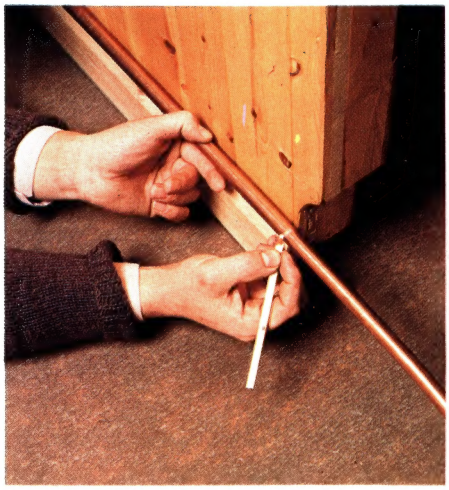
Before attempting to make bends in a pipework run, try the techniques on a spare length beforehand to practice.

The greatest problems in planning a pipework route occur when bends have to be made in one long, continuous length of tubing. The routine is one of start, measure off, make a bend, measure off a straight, measure off the bend, make a bend . . ., and so forth. All measurements should be made along the centre line of the pipe, especially around bends. Copper piping can be worked into shape beside the pipe run, and literally fitted into place to check measurements of lengths and bends.

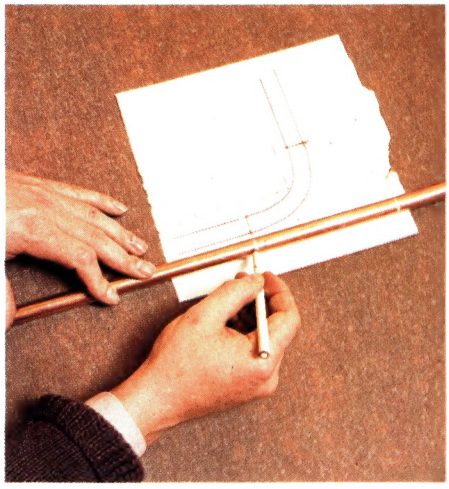
If you adopt this procedure of starting at one end of a pipe run, use a generous length of piping so that, even on the basis of an initial rough measurement of the pipe run distance, there is still enough to enable trimming at the far end. The pipe run can then end just where required, perhaps tidily out of sight and harm's way.

With this method, mis-judged distances and badly-positioned bends have to be accepted or the whole pipe length has to be replaced.

So wherever possible, make individual bend sections instead, and link these with a suitable capillary or compression joint on the straight sections where trimming and joining present less of a problem.



1 *Mark the start of the bending length at a point a little before the corner of the wall. Direct measurement is best*



2 *Draw out a rough and ready pattern to help you mark out the bending length and to use as a guide when bending*

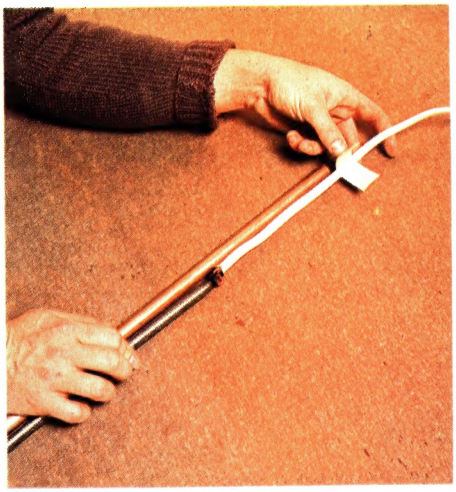
Planning a pipework route

An accurately measured pipework route tends to minimize the number of errors made in a pipe run. If you are going to do the bending by hand, using a bending spring, there is little point in bothering with anything but the coarsest measurements as measurement errors are bound to occur near the bend. Usually this 'shift' can be dealt with by trimming or adding to the reckoned length of a straight on one side or other of the bend.

If, on the other hand, you decide to use a pipe bending machine, accurate measurements can be and ought to be made—particularly when two or more pipes are to run parallel and on display for part of the run.

3 *Anneal the bending length. A firebrick 'oven' prevents flame damage and concentrates heat but is not essential*

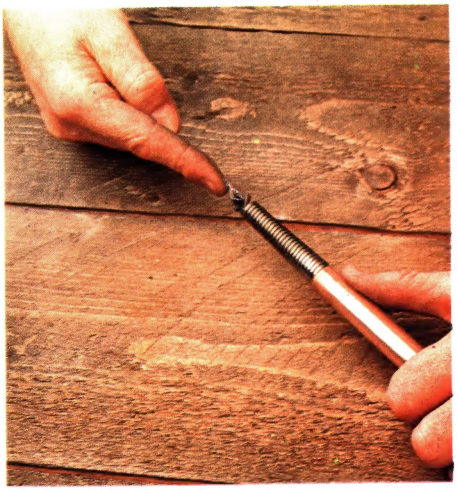
4 *Quickly cool the heated tube using jug and basin if away from running water. Small pieces and pipe ends can be submerged*



5 *If the bend is made more than the bending spring's length along the tube, attach stout wire to help later removal of the spring*

6 *Light lubricating oil or graphite powder can be used to make bending spring insertion and withdrawal easier*

7 *Place some lubricating oil on a cloth and draw the bending spring through this a few times. Only the lightest coating is necessary*



8 *Insert the bending spring using a clockwise, tightening, wrist action until it straddles the region where the bend is required*

Instructions on the use of such machines vary from model to model, so follow these carefully if you decide to hire one for your project.

The actual overall length of any pipe run corresponds with the centre line of the tube (fig. A), but bear in mind the distance the tube stands clear of the supporting wall when taking measurements. Bending points and other register marks can be easily marked on the copper tubing which is then progressively fed through the bending machine.

Where the pipe run is out of sight, and remains adequately supported, bends and routes can take almost any convenient form. But if the pipework is to remain open to view, bends look best following the supporting wall as closely as possible. This means using rather more 90° bends than may be strictly necessary.

But otherwise never use a 90° bend when a shallower one will suffice. Not only is the shallower bend much easier to make, but its shape causes far less of an obstruction to the flow of water within.

The radius of any bend should be no less than four times the width of the tube (fig. A). So, if you are using 22mm tube, for instance, the radius of the curve (to the centre line of the tube) ought to be no less than 90mm. This rule prevents bends that are too tight—and the difficulties of making and of including these in a pipework system.

Obviously, a 90° bend requires a quarter-circle of curve. The 'bending length' needed for a 90° bend is halved in the case of a 45° bend, and divided by three for a 30° bend (see fig. A). It is useful to mark the pipe with these bending lengths to aid annealing and bend manufacture.

Using a bending spring

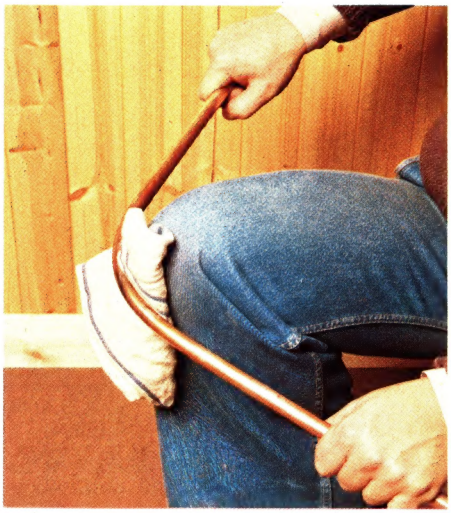
A bending spring is the most popular means of making a bend in smaller bore domestic installations, and with care very good results are possible once the correct techniques are mastered. The spring should be slightly greased for use (fig. 6) and then the next step is to locate and mark the pipe at the centre point of the bend and at

9 *Make the bend over your knee. Pull firmly but very slowly until the required angle is reached and overbend very slightly*

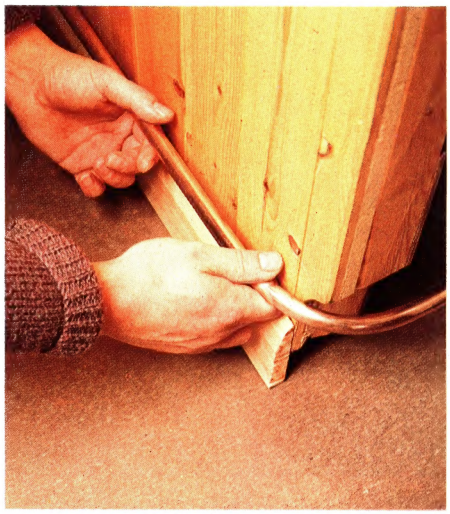
10 *Pull back the overbend carefully to release the bending spring and remove it. Use a screwdriver for twisting the spring*

11 *Tube hardens as it is bent so thicker pipework may need annealing several times to make a bend—three times for a 90° bend*

12 *Grease the spring again and use a screwing motion to replace it in the tube, using some leverage if necessary*



13 *Continue making the bend using a firm pull. Mould the bend around your knee as you go, overbending slightly*



14 *Fitting the pipework in place. If the bend is not quite correct, then it may be possible to alter it slightly*

the bending length extremes.

Next anneal the bending length, even if you are using half-hard tubing. When the pipe has been cooled, insert the bending spring so it straddles the bend section. A spring is only about 600mm in length, so extension rods or very stout wire must be provided if a particularly long pipe section is being bent near its centre. In the case of a long pipe run requiring more than a single bend in its length, start with the middle bend and work outwards.

Attached to the eyelet of the bending spring, the extension rods or wire length can be laid alongside the tubing and marked with a tape flag to indicate when the spring has been inserted correctly (fig. 5).

It is not difficult to bend 15mm or smaller bore copper tube over your knee, but protect yourself with padding as shown to prevent injury (fig. 9). Larger bore tube may be possible to bend by hand but a former —a stout post, or horizontal bar—is usually necessary.

Bend the pipe very carefully and very slowly—in stages—to a slightly greater degree than required, then pull it back to the correct angle. This restores the true cross-section of the tube, and also releases the bending spring which will be pressed against the throat of the bend.

A large nail, tommy bar or screwdriver inserted into the eyelet provides enough tightening and leverage for the spring to be removed easily.

Except possibly in the case of 15mm tube, piping needs to be annealed two or more times before a 90° angle is reached, because the copper hardens through bending strain. Never use force, and always pull the angle slightly straight before withdrawing the spring and again annealing the bend section.

After you have made a bend, try the tube in place. If it is not correct, you should find it possible to reinsert the spring and with careful manipulation slightly alter the position and angle of the bend.

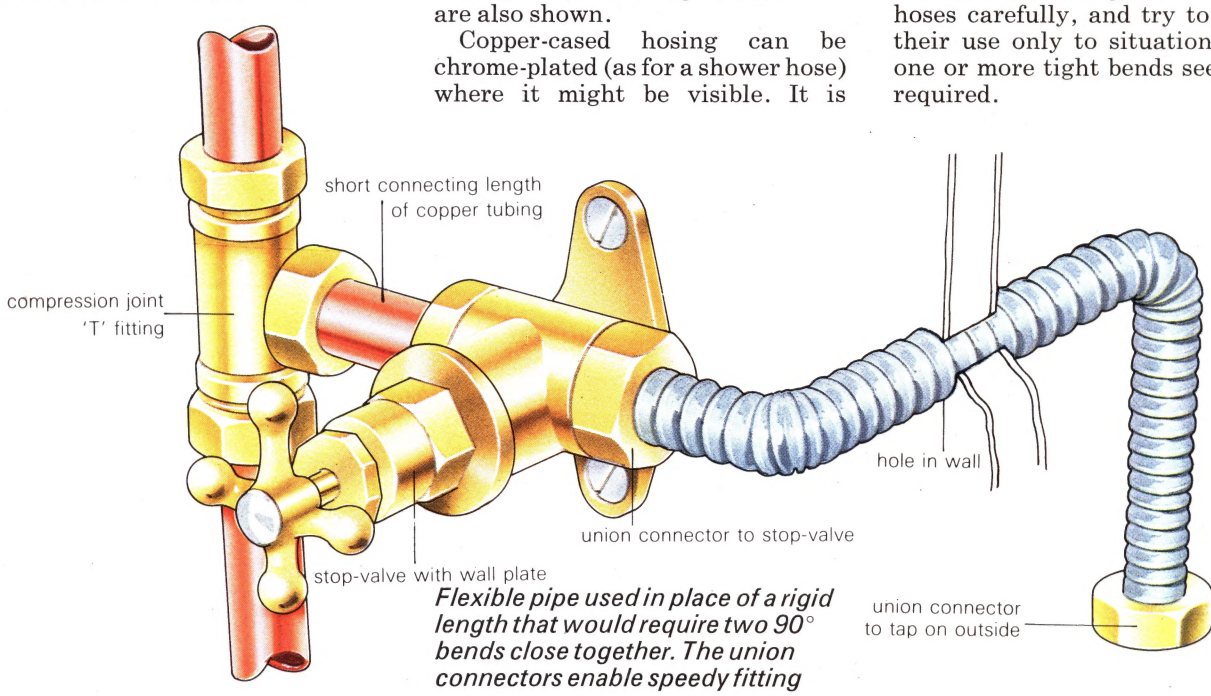
Using flexible pipe

Sometimes it is more convenient to do away with rigid bends and fittings and make use of copper or plastics flexible plumbing hose. These hoses usually come complete with end fittings for speedy connection to existing parts of the pipework.

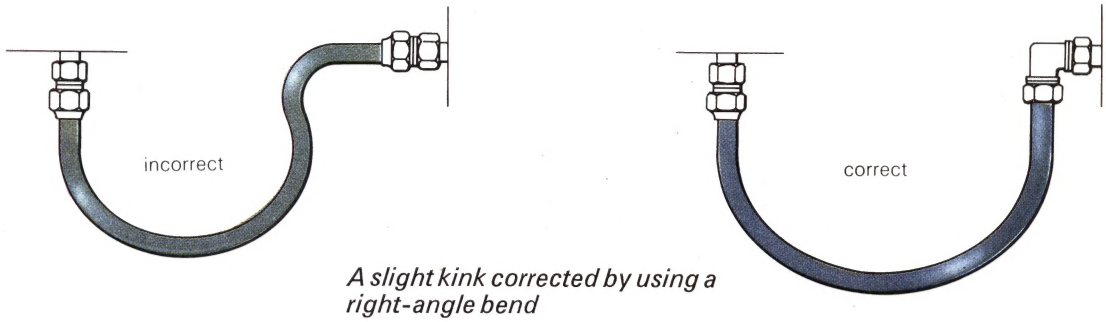
Two typical uses are illustrated in detail: where a connecting length of pipe has to go through a wall, and for simplifying the installation of one tap design in a variety of sanitary fittings. The 'right' and 'wrong' ways of using flexible hose are also shown.

Copper-cased hosing can be chrome-plated (as for a shower hose) where it might be visible. It is normally provided with union connectors. Plastics equivalents—normally made of polypropylene—have all but replaced copper as they are suitable for most domestic applications.

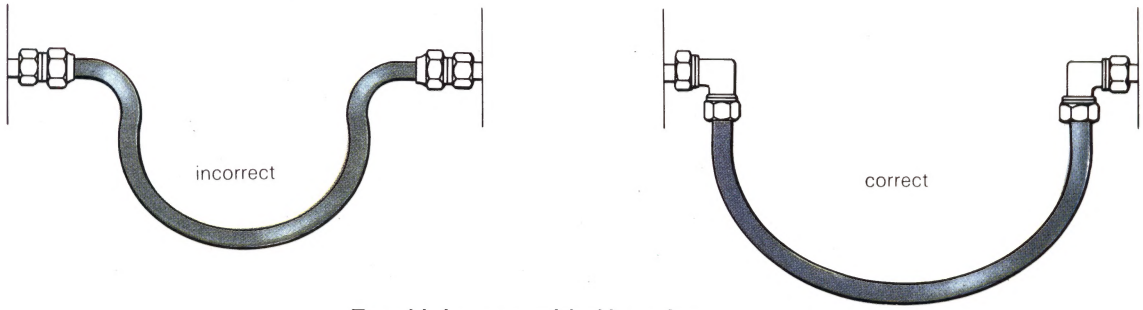
Follow the fitting advice on these hoses carefully, and try to restrict their use only to situations where one or more tight bends seem to be required.


short connecting length of copper tubing
compression joint 'T' fitting
hole in wall
union connector to stop-valve
stop-valve with wall plate
union connector to tap on outside

Flexible pipe used in place of a rigid length that would require two 90° bends close together. The union connectors enable speedy fitting



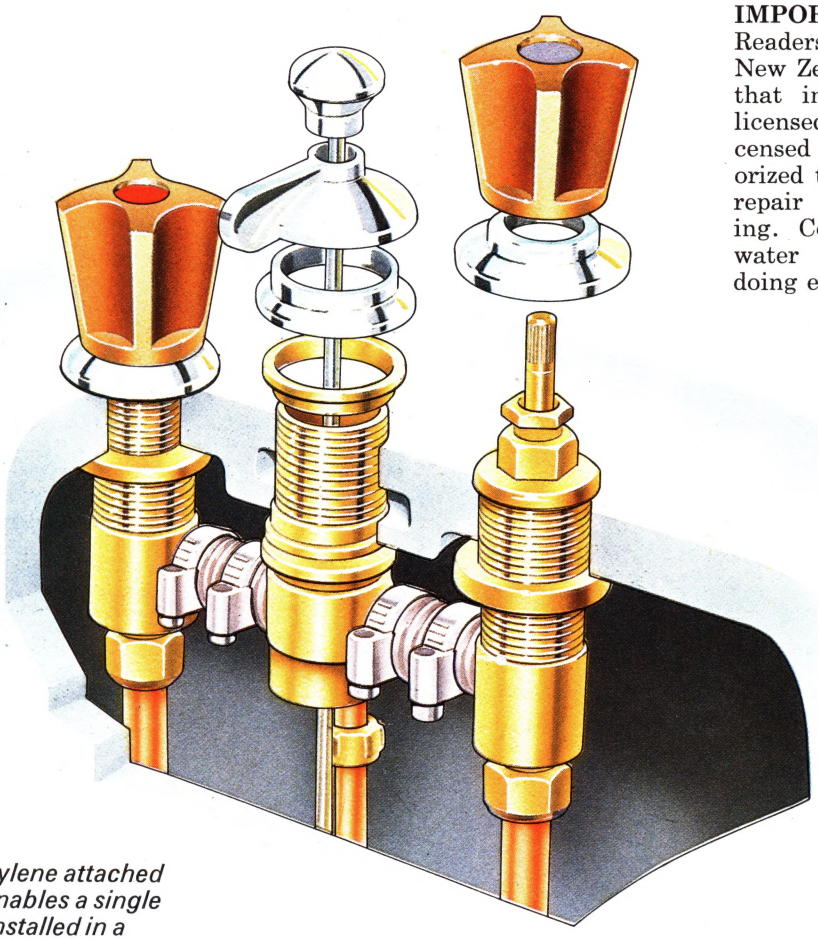
A slight kink corrected by using a right-angle bend



Two kinks are avoided by using bends in place of straight connectors

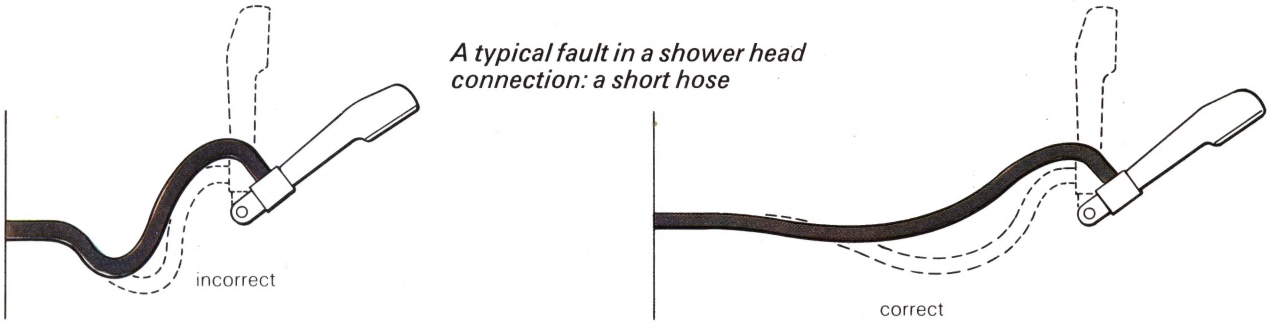
Advertising Arts

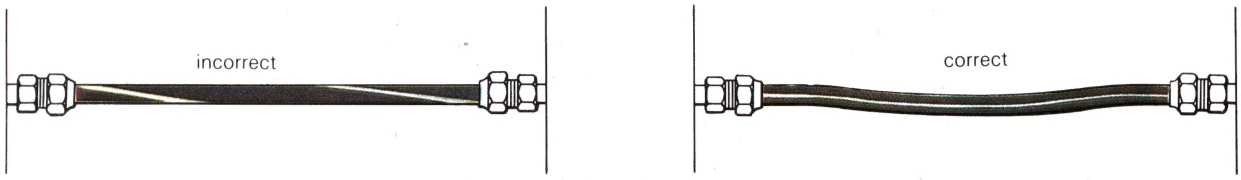
IMPORTANT NOTE
Readers in Australia and New Zealand should note that in all States only licensed plumbers or licensed drainers are authorized to alter, extend or repair household plumbing. Consult your local water authority before doing even minor repairs.



Flexible polypropylene attached by Jubilee clips enables a single tap design to be installed in a variety of fittings

A typical fault in a shower head connection: a short hose





Avoid twisting the hose when tightening the end fittings

Advertising Arts

On reflection

Mirrors are marvellous for faking what a room often lacks. The illusions of different dimensions and extra light they give to a room make them one of the most versatile forms of decor

Below: *The wall-to-wall mirror doubles the apparent size of this room—and, by reflecting the nearby window, also increases the apparent amount of light in the room*

Elizabeth Whiting

Home designer

When you use mirrors as part of your design scheme you are dealing with illusions. These are no mere looking glasses. Height, length, width and light can all be created by reflection and as space is so often limited in a modern home, mirrors have an important role to play.

The most extravagant and luxurious effects are created where a mirror completely covers a wall. Here the mirror itself must seem to be invisible —it should give the impression that if the wall on which it is fixed was not there you could walk right on through it.

You can give the impression of a much longer room, for example, by fitting a floor-to-ceiling mirror panel in the centre of an end wall. But the junction of the mirror with the ceiling and floor must be hidden. The whole effect is lost if the mirror extends down only as far as the skirting board or up as far as the picture rail. For the illusion to be successful, there must be no obvious break in the reflected image.

A ribbed ceiling treatment will conceal upper edges and the skirting board can be removed to allow the mirror to be fitted flush to the floor. Flanking the mirror either side with a panelled, decorative wallcovering conceals the side junctions so that the image is contained. This means that the eye is not disturbed by the image coming to an abrupt end.

A mirror fitted perfectly into the shape of an alcove or recess will give immediate impact. The depth of the room will be enhanced and the mirror is an ideal background for ornaments or plants. The plants will look particularly attractive, doubling in apparent density and providing a gentle screen for the people in the room from their own reflections. It can be disconcerting to sit in front of a mirror reflection of yourself and so it is best to position mirrors where they reflect the surroundings and not the people in the room.

An effective and practical use for large mirror panels is in narrow hallways. Floor-to-ceiling mirrors here help give the appearance of space, as well as reflecting light in what are often rather dark areas. On an end wall a mirror makes the hallway seem longer; put on a side wall it adds width.

You must remember, however, that although mirrors are fairly tough, even the thicker ones are vulnerable at floor-level. Vacuum cleaning, knocks from toys or other hard objects, even accidental kicks and scuffs can all crack a glass surface. Positioning the mirror at about one metre from the floor along the full length of a wall is an attractive alternative which will provide many of the same effects and may be safer where there are small children or old people to consider.

Add variety

Where you want something more interesting than a plain mirror surface there are several alternatives to consider for each room.

Flexible mirrors are available for contoured surfaces, such as going around corners. They are made up of small rectangular or square mirrors on a flexible backing. This kind is

Susan Griggs

Right: *Mirror tiles set at right angles to the window 'double' its size and the view it gives*

Elizabeth Whiting

Below: *In a small room, combine an unusual light fitting with a mirror to add both space and drama*

used purely for creating a decorative effect in a room, as even when laid flat the image from the mirrored surface is slightly distorted.

Mirror tiles also break up the reflecting surface, but do so without distortion. They are extremely easy to fix—usually they have self-adhesive tabs on the back—and are therefore suitable for large areas where a single sheet of glass would be difficult to cut and handle.

Furniture can have mirror tiles incorporated in it for unusual effect—for example, shelving, tables and room dividers—but remember, for a mirror to be effective it must have something attractive to reflect.

Mirror tiles will help make any room lighter if they are fitted in the inner reveals of the windows. Tiny mirror tiles set at right angles to the window look good and seem to double the window's length as well as the view it gives.

Using mirror tiles in this way is perfect for the kitchen which usually gets rather neglected as far as mirrors are concerned. When necessary, they are as easy to wipe down as ceramic tiles—and a quick rub over with the window cleaner restores their sparkling reflection. They will also add light to a work surface if they are fitted behind worktops.

All small areas—under the stairs, confined work or storage areas—are opened up by the addition of a mirror because it helps to distribute whatever light is available.

When light—sunlight or electric—catches a geometric pattern of differently sized (mainly small) mirror tiles, it throws a kaleidoscope of pattern around the room. The colourful image within the wall of mirror tiles also makes a lovely focal point for any room in the house.

Mirror tiles come in a wide range of sizes and colours—the most popular being silver, bronze and grey.

Smoked glass gives a soft, flattering effect and can be used to advantage in many situations where a bright

Ray Duns

Elizabeth Whiting

Above: *This bedroom's subtle, warm atmosphere is softly reflected in its wall-to-wall mirror*

Left: *This mirror—alternately smoked and plain glass—adds space and interest to a narrow hallway*

Right: *A door which is a mirror can provide full-length reflections where there is a lack of wall space*

Elizabeth Whiting

Above: *Traditional, but never boring! Large wall mirrors make the most of every colourful object in this room*

Right: *This unusual mirror becomes the focal point in a bedroom where wall space is limited*

clear reflection is not needed. In living rooms it can give a sophisticated appearance to an alcove or wall and in a bathroom, bedroom or hallway it provides a flattering reflection for large areas. Such mirrors give everyone an instant suntan!

Alternative finishes

Reflecting float glass is another unusual finish with many decorative possibilities.

When light shines behind it, the effect is of normal clear glass but when the conditions are reversed—with light shining on the front and darkness behind—the float glass becomes a mirror. This property makes it ideal as a room divider or as a hinged screen in a bedroom or bathroom—for additional privacy.

There are several modern alternatives to silvered glass for reflecting surfaces. Although they may not be cheaper, they are much lighter and easier to cut and fix than traditional glass mirrors and so can be adapted

Elizabeth Whiting

to many different uses. They are also often more suited to weak partition walls which could not support the weight of a full wall of glass.

For walls and ceilings a most suitable mirror effect is provided by acrylic mirror-faced chipboard. This is especially useful for disguising uneven ceilings. But it is unsuitable for bathrooms as the porous chipboard backing will be affected by condensation—it will swell and warp.

Ideal for bathrooms is plastic mirror fixed to polystyrene sheets. It gives a good reflection, is extremely light and, because it is warm, is not so prone to steaming up as conventional glass. It can also be cut to size with a saw and comes in many colours.

Also for steamy bathrooms are plastic mirrors which have been vacuum-coated with aluminium to minimize misting.

Glass mirrors in bathrooms—unless they are made of very high-quality float glass—are particularly vulnerable to losing their shine, as the silvering is often affected in the long term by steamy conditions. If the back of the mirror is permanently damp, its silver will disintegrate. An air space left behind the mirror, so that the air can circulate, will prevent this. But make sure, if you frame a mirror yourself for the bathroom, that the seal is watertight.

Whatever reflective material you use, you should follow the manufacturer's instructions explicitly when applying it.

Small is beautiful

Sometimes you want to put a mirror in a room purely as a looking glass. Then it must be positioned so that it gives the best possible reflection.

Shaving or making-up require a well-lit, plain mirror. Those with a choice of normal or magnifying reflection are ideal—especially if they are on a swivel so they can be angled towards the light.

Where it is not possible to fit a mirror near a window, you can improvise by siting it opposite a plain, pale-coloured wall. With the reflected light from this, the image—especially the outline of clothes—is clearer.

For full-length vanity you need either to fit a very large mirror or to have room to step back far enough to see a full-length reflection in a smaller one. In some bedrooms neither of these options is possible.

One answer to this problem is a convex mirror (like a television screen) which will give a full-length reflection from a relatively small distance away. You may have to order this from a large department store.

The traditional triple-hinged mirror on a dressing table has never dated—nor has its decorative and practical potential to the bedroom been diminished. Its reflections of your dressing table ornaments, the additional space it brings to the area, the almost full-length view provided by the normally hinged centre mirror—all these properties make this mirror attractive.

Mirror pictures

A mirror picture can be a beautiful object in its own right, whether it is an antique in a lovely delicate gilded frame or a bright, modern reproduction of an old advertisement. Intended purely for their decorative value, these mirrors enhance the walls of any room.

The variety of mirrors is endless and chosen and placed with care they will add their special light and gleam to every room in the house.

Four ways of fixing mirrors

Right: *To screw-fix a pre-drilled mirror, measure accurately where the mirror is to go—making sure it is straight—and mark the drill hole positions. Use wall plugs in the drilled holes and when screwing in place, make sure that the mirror is protected by screw cap washers in front and spacer washers behind.* **Far right:** *A rebated rail fixing needs rails top and bottom with clips at the sides of the mirror to prevent movement.* **Below left:** *To fix a mirror with corner clips, first mark the position of the bottom two, drill the holes and screw them into place. Slot the mirror into these clips and place the top two in position. Mark off; remove mirror and drill holes; replace mirror and fix.* **Below right:** *Sliding clips should be fixed about 25mm from the corners of the mirror. On the wall, draw round the mirror shape and measure off the positions of the sliding clips. Drill and screw them all into position and first fix the mirror in the bottom two. Then pull back the side and top clips and push them over the mirror*

Venner Artists

Feature wall mirror

Maison De Marie Claire/Bennett/Ertaud

The most effective ideas are often the most simple ones. This set of mirrors is easy to make and yet its professional appearance can be easily adapted to any room. Whatever the shape of room or wall space available, use two supporting rails for a versatile set of sliding mirror panels.

If you dislike the natural wood finish of the frame, it can be painted to blend in with the rest of the room's decor. And when you tire of the position of the mirrors, slide them together to make a solid block or have only one space instead of two.

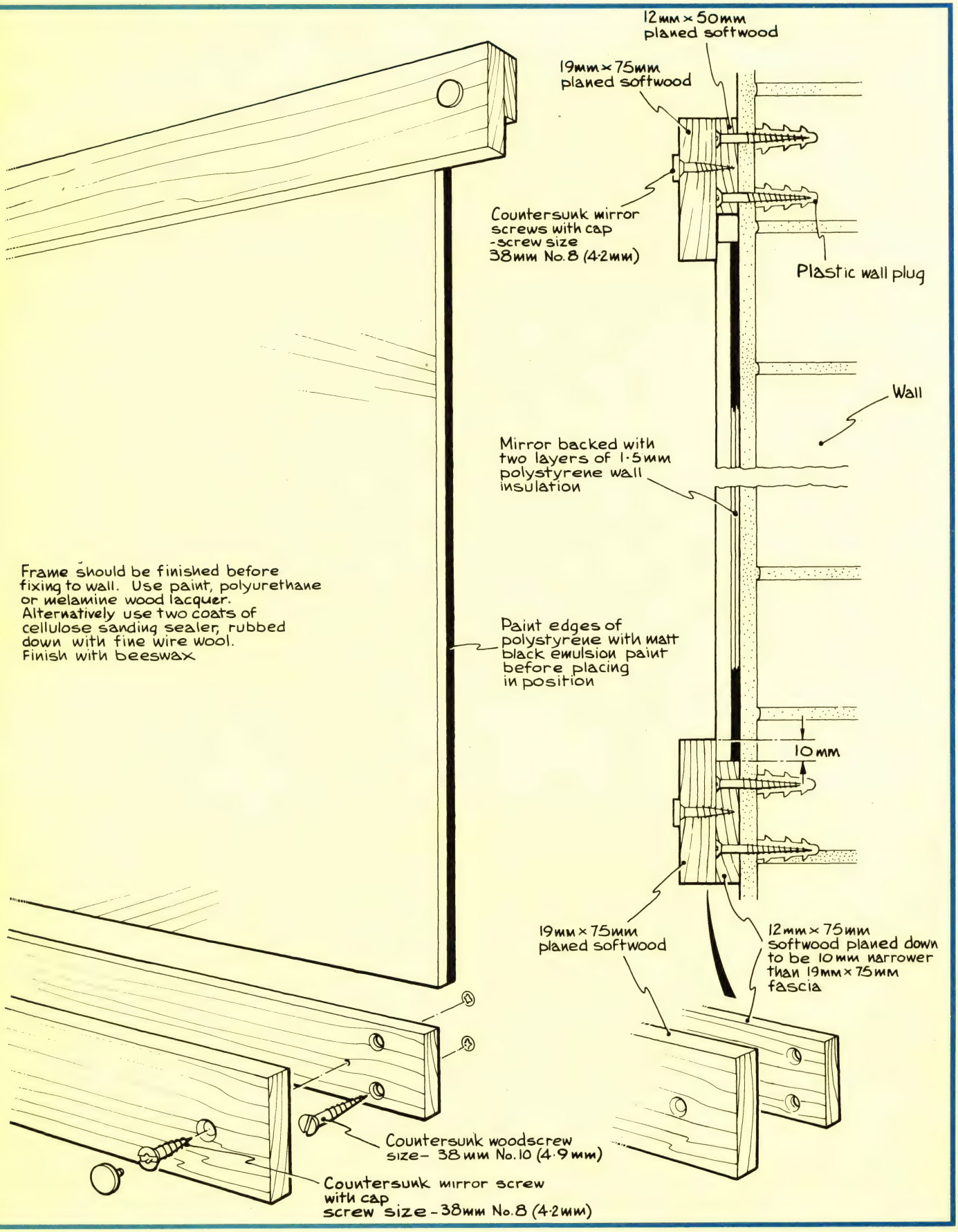
Whichever way you decide to position the mirrors, however, always make sure that there is something interesting for them to reflect. This is where the art of using mirrors comes in: if you position them opposite a blank wall, the effect is going to be no more exciting than another blank wall.

The area behind a settee is often a difficult one to decorate, but with this mirror arrangement you can overcome the problem, while adding new dimensions to the room.

In a bedroom, this mirror would make an interesting bedhead, and in a bathroom a special kind of splashback along the side of the bath. Or on one side of a narrow passageway—positioned at the right height—a mirror arrangement such as this saves a lot of redecorating. Mirrors can be wiped clean of fingermarks indefinitely, unlike most other wall coverings.

If your mirror battens are to be fixed to a stud partition wall, be sure to screw them to the studs, not the nogging. On solid walls make sure fixings are strong enough to support the weight.

Above: *One of the ways in which this simple mirror arrangement could be used—as a focal point for the often bare area behind a settee*


12mm × 50mm planed softwood
19mm × 75mm planed softwood
Countersunk mirror screws with cap -screw size 38mm No.8 (4·2mm)
Plastic wall plug
Wall
Mirror backed with two layers of 1·5mm polystyrene wall insulation
Frame should be finished before fixing to wall. Use paint, polyurethane or melamine wood lacquer. Alternatively use two coats of cellulose sanding sealer, rubbed down with fine wire wool. Finish with beeswax
Paint edges of polystyrene with matt black emulsion paint before placing in position
10mm
19mm × 75mm planed softwood
12mm × 75mm softwood planed down to be 10mm narrower than 19mm × 75mm fascia
Countersunk woodscrew size- 38mm No.10 (4·9mm)
Countersunk mirror screw with cap screw size - 38mm No.8 (4·2mm)

Advertising Arts

Project

Dig a garden pond

Making a garden pond is not the daunting task it might at first seem. If you can dig a hole you can build a pond using an inexpensive stretch rubber liner

A simple garden pond is very easy to build—all you need is a hole in the ground dug to your chosen shape and lined with butyl rubber sheet, a tough durable material easily obtainable from specialist water garden centres.

Location is important. A pond looks best when sited at the lowest part of your garden, where water would collect naturally. But it is important to site the pond in full sunlight to maintain healthy plant growth, so you should avoid areas which are in the shade of walls or trees. Remember, a pond sited under or near trees will quickly clog with leaves in the autumn. If you plan to include a cascade feature, you will also need a waterproof electricity supply for the pump.

Dig the hole any shape you like provided you keep the basic dimensions of the butyl rubber liner (in Britain, 4m x 3m). You should follow the stepped profile of the sides as shown overleaf, including the planting shelf, which provides a suitable environment for plants which thrive in shallower water. The overall depth of the pond is to some extent optional, but should not be less than about 350mm. A good average is about 500mm.

When the pond has been lined and filled, paving stones are used to conceal the edges of the liner and to provide a firm surround. If you want a simpler pond, it can be left at this stage, but the design overleaf also incorporates a rockery and cascade.

The rockery is formed by the spoil from the excavation, covered with boulders. The cascade is easily arranged using a special waterproof pump and a small preformed fibreglass pool.

You should leave the filled pond for about one week before installing plants or stocking with fish. Water plants prefer still or slow-moving water, so you should plant them in the calmer areas of the pond. Line the bottom of the pond with 200mm of plain fibreless loam. Do not use leaf mould or manure, as these give off gases which are poisonous to fish. Alternatively, you can plant in special containers available from garden shops. These have a thin layer of gravel on top to prevent the plants from floating.

Different plants thrive at different depths. Marginals, like irises and arrowheads should be planted on the shelf. Lilies and other deep water aquatics go in the deeper part of the pond. Floating aquatic plants can just be placed on the surface of the water. Plant sparingly—remember that the plants will spread.

If you are stocking the pond with fish, such as goldfish or golden orfe, spread a thin layer of gravel in the bottom of the pond. Feed the fish sparingly and do not overstock a small pond. In winter prevent icing over with a couple of layers of rush matting—fish suffocate without air.

Allow the water a few weeks to clear and achieve its natural balance. A healthy pond should be clear and clean. Rockery plants will add interest to the border, but make sure that soil does not wash into the pond. Make sure, too, that no other forms of garden debris contaminate the water.

Right: *A water feature adds interest to any garden, particularly when it is well stocked with water plants, as this one is*

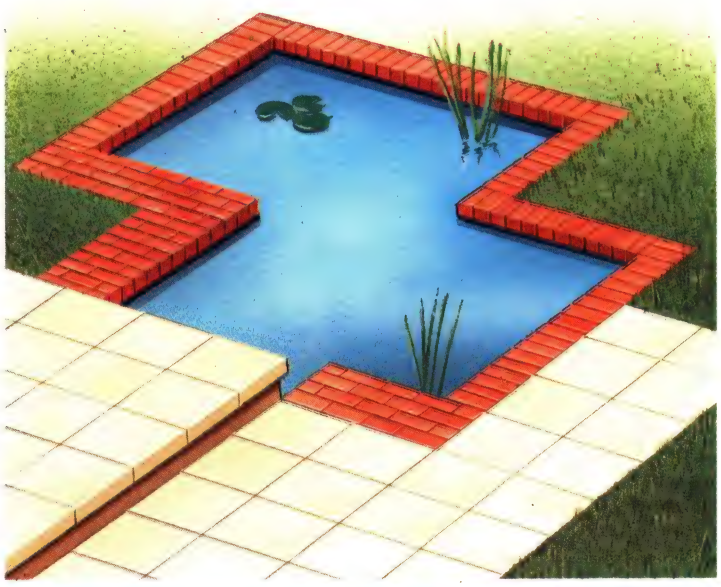
Design your own pond

It is easy to adapt the basic pond building technique to suit your own design. These three alternatives all use the same basic method of lining the excavation with a butyl rubber sheet to retain water. If the overall dimensions are similar, you can use the same sized sheet. A larger pond will need a larger sheet in proportion, but other constructional details are the same.

The first alternative, in a contemporary style, combines the pond with a large paved area. This is easy to build, as no pump is needed.

In a formal style, the second design uses a fountain which is obtainable from garden centres.

The last design is a very large version built on a mound or bank.



Michael Warren

Lotus Water Garden Products Ltd.

Workplan

Materials needed for basic pond:
4m x 3m butyl rubber sheet in black or a stone colour
Crazy paving slabs to cover 7m²
Sandstone boulders for rockery
Bricks for surround (approx 50)
Sand and cement as required

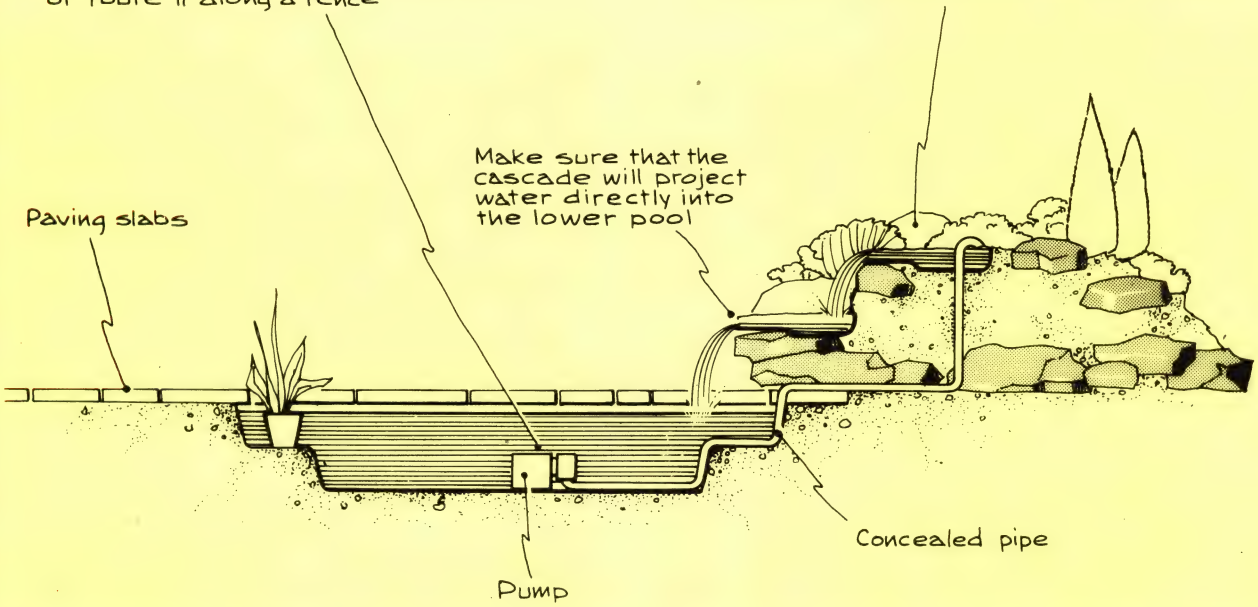
For pond with cascade feature:
Submersible pump
Plastic hose
Weatherproof electrical connector
Small preformed fibreglass pool
Weatherproof armoured cable to reach domestic electrical supply. This should be wired into the consumer unit (main fuse box) at a spare way. It can be disguised in the undergrowth

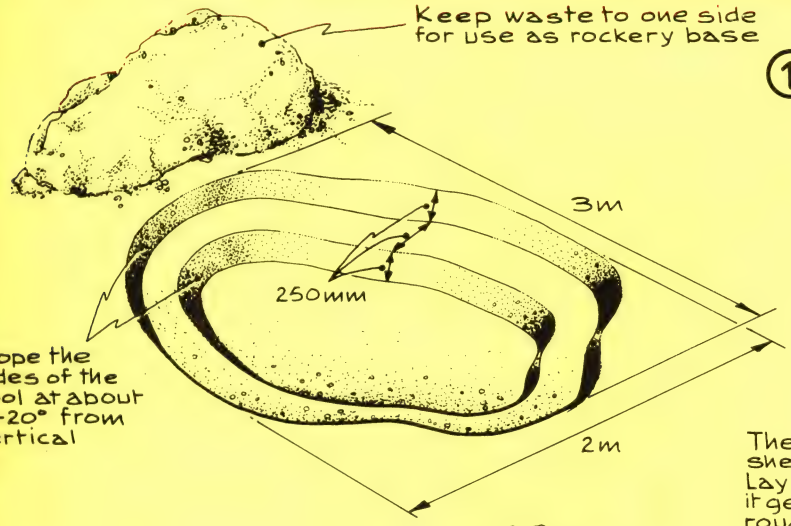
Use the designs on this page to build this delightful pond with paved surround, a rockery and double water cascade

Pumps and special waterproof cables are available from specialist water garden centres. Fit a submersible pump in the lower pool with a concealed pipe running to the upper pool. Use a special waterproof cable sealed into the pump under the water with a waterproof connector near the pool. This should be permanently wired into the house electricity supply with a special outdoor waterproof armoured cable. Bury this out of reach of digging, cultivators, etc (at least 500mm deep) or route it along a fence

Use the excavated earth and boulders to form a rockery, leaving a hole for a small pre-formed glassfibre pool. The hole should be slightly larger than the pool itself. Install the pool and pack earth all round the sides, making sure that the pool is level. Use boulders to conceal the edges.

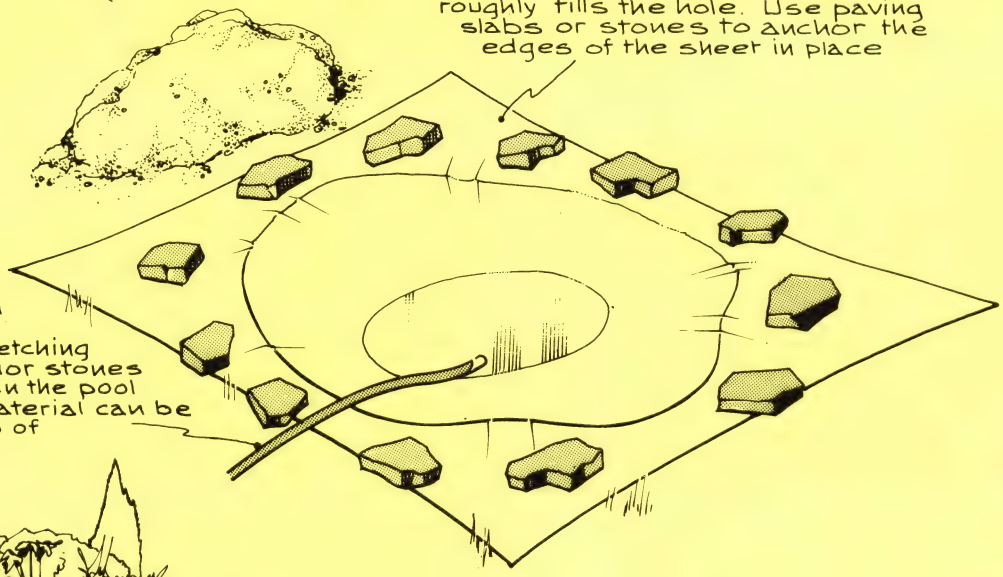
Sandstone is particularly suitable for rockeries. Use as large stones as possible and place them close together. Rock plants thrive on small cracks and crevices



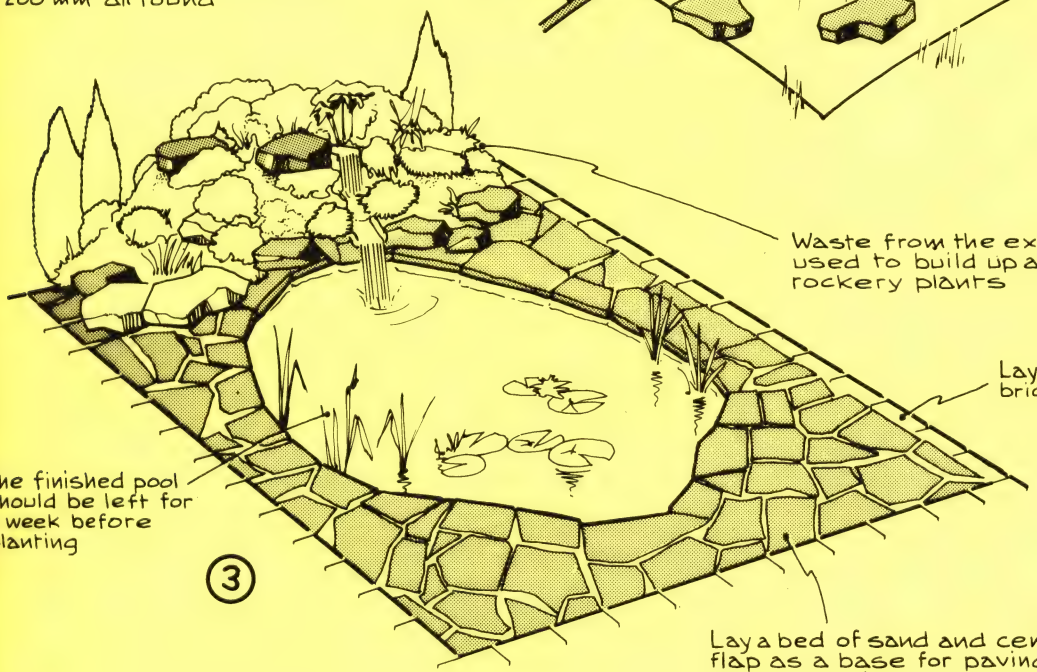


1 The first stage is to excavate a hole for the pool. Its overall shape is optional, but the angles and dimensions of the sides should remain about the same as shown. Make sure that the earth around the pool is level with a board and spirit level. If not, adjust at this stage. Remove any sharp stones from the inside surface of the hole and line the walls to a depth of 25mm with damp, coarse sand or sifted earth

The pool liner is a 4m x 3m butyl rubber sheet in either a black or stone colour. Lay this carefully in the hole stretching it gently in the centre so that it roughly fills the hole. Use paving slabs or stones to anchor the edges of the sheet in place



2 Start running water into the stretched liner. The weight of water will gradually pull the liner down into the hole by stretching it and drawing the anchor stones towards the hole. When the pool is full excess loose material can be trimmed to leave a flap of 200 mm all round



Waste from the excavation can be used to build up an area for rockery plants

Lay a single course of bricks to form a surround

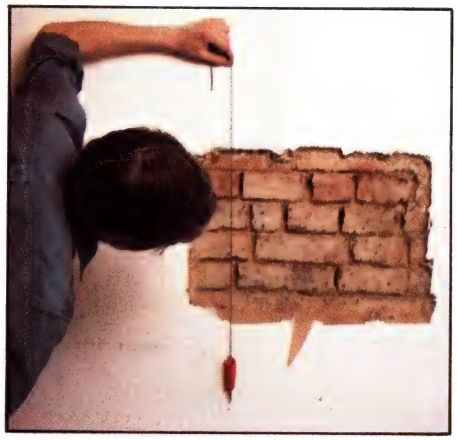
The finished pool should be left for a week before planting

3

Lay a bed of sand and cement over the edge flap as a base for paving. The slabs are laid to overhang by about 25mm which will conceal the edge flap. The top surface of the slabs should be level with the surrounding grass

Advertising Arts

5 *Measure from an exposed joint to the edge. Move the cutting area over if it does not correspond to a vertical and horizontal joint*



6 *When the cutting edge corresponds to a mortar joint, use a plumbline to check that it is level and ensure the opening will be square*

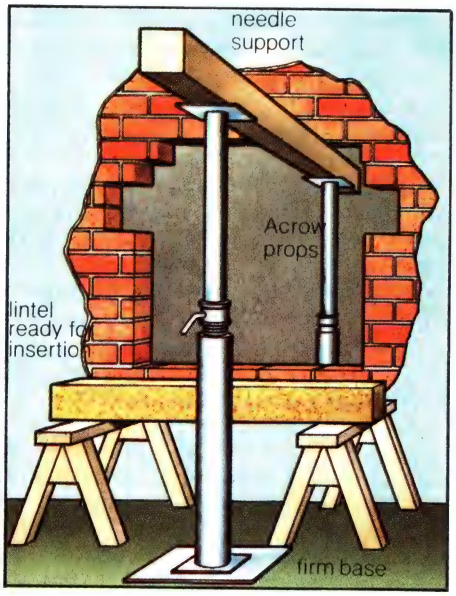
7 *Mark in the position of the lintel directly above the top cutting line. Again, use a spirit level to keep the line straight*

Gavin Cochrane

8 *Using a club hammer, drive a plugging chisel into the vertical joint in the centre of the cutting area to gradually loosen it up*

9 *When the mortar all around the brick has been loosened, try to ease it out. A stubborn brick can be broken up with the bolster*

10 *Subsequent bricks should be easier to remove. Then chip away the remaining plaster so that all the brickwork is exposed*



Bernard Fallon

A. *Walls with openings of more than 1m must be supported until the lintel is fitted in place*

Cutting out the opening

The secret of demolishing brickwork is to work carefully and steadily, removing only a little at a time. Start with a vertical joint in the middle of the cutting area and drive in a plugging chisel with a mallet (fig. 8). Loosen the mortar around one brick and try to ease it out. If it will not move, smash it out (fig. 9).

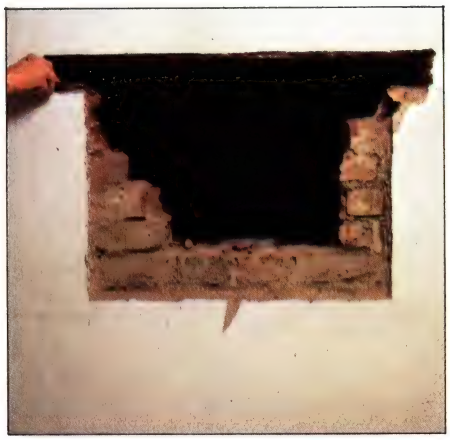
After you have removed one or two bricks in this way, you can exchange the plugging chisel for the bolster. By driving it into the mortar joints, you should be able to lever bricks away rather than have to smash them out. Continue using the plugging chisel on vertical joints.

Enlarging the opening is a gradual, careful process and only small sections of masonry should be knocked out at a time. Too big a 'bite' with the chisel will result in uncontrolled cracking and possible major structural damage—so be careful.

Chisel cuts about 20mm apart should be completed step-by-step fashion (fig. 10). By angling the chisel blows into the line of the wall outside the cutting area, the blows are absorbed by the wall bulk and the vibration shock is lessened. This helps reduce the chance of uncontrolled cracking.

When the wall is hit at right-angles none of the vibration is absorbed and there may be loosening of nearby fittings, such as wall cupboards.

You should continue chiselling until you have cut the slot for the lintel (fig. 11).



11 *Using a club hammer and bolster, knock out the brickwork at the top of the opening ready for the lintel to be inserted in the hole*

12 *Lay down bedding mortar for the lintel and slide it into place. Before packing it into place, use a spirit level to check its position*

13 *The remaining bricks can now be cut out of the opening—this time using the club hammer and a bolster chisel*

14 *Big gaps between the lintel and its supporting brickwork must be packed with bits of brick. Trim them to size when the mortar has set*

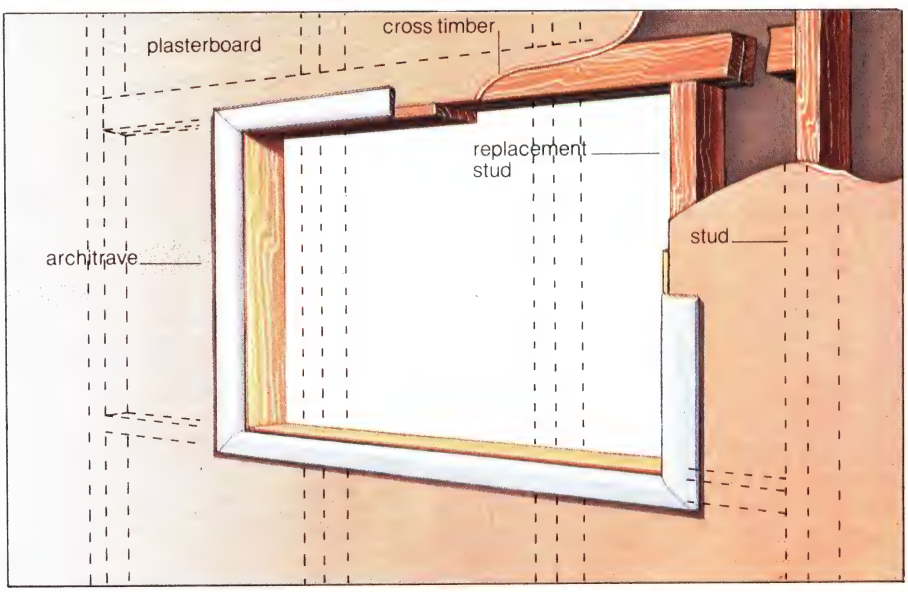
15 *Use the same mortar as that for bedding the lintel to fill the space around it. Pack the mortar well in with the edge of a trowel*

16 *The opening is complete and ready to receive whatever finish has been decided on. Leave the mortar to dry for about a day*

Inserting the lintel

Make the bedding mortar for your lintel from three parts of soft sand to one of Portland cement with just enough water to make it workable. Slide the lintel into place and let the mortar under it harden overnight before you proceed. Check that the lintel is plumb and level (fig. 12), before the mortar dries—then you can cut the rest of the opening (fig. 13).

If the space is deeper than a normal joint (10-15mm), reinforce it by driving in bits of slate, knocking off the projecting pieces with a hammer when the mortar has dried (fig. 14). Fill the space above the lintel with the same mortar, pushed well into the gap.



B. *A stud and plasterboard wall may require replacement studs to be fitted at the edge of the opening*

Bernard Fallon

Cutting the main hole

The plaster must be gradually stripped back to the line of the final cut and cut neatly with the bolster. A neat job at this stage reduces the amount of making-good needed when the framework is installed (fig. 16).

In a solid wall you must cut off all the half- and quarter-bricks that project into the opening. Tap them firmly on top with the hammer and bolster, then a bit harder from the face side to cut them off squarely.

In an outside cavity wall, the procedure is slightly different. Square off the opening in the outside leaf as you would for a solid wall. But do not cut off the protruding bricks or blocks on the inner leaf—they will be needed to close the cavity later. Closing a cavity wall is covered further on in the course.

Openings in stud partition walls

The first step in making an opening in a stud partition wall is to find the studs. Bang on the wall with your fist; where you hear a 'solid' sound there will be a stud.

The next step is to site the opening so that you will do as little damage as possible to the plasterboard (wallboard). You will anyway have to cut the opening over-depth so that you can nail the timber lintel to the studs on either side. Try, by siting the opening neatly between two existing studs, to avoid having to cut over-width as well —otherwise you will have a lot of plasterboard patches to fit.

Mark out the proposed opening, plus the depth of the lintel and bottom bearer (fig. B), in the same way as for a masonry wall. Cut the plasterboard on one side with a handyman's knife and steel rule. Then poke a nail through the wall, at each of the four corners, to show where to cut the other side.

Next, saw through the middle stud or studs at the top and bottom. To help keep your saw cut straight, use a pencil and try-square to mark right round the studs, and saw alternately from each of the four edges.

Skew-nail the lintel to the studs on either side of the opening, and nail in the bottom bearer. You may also need vertical packing pieces between the lintel and bearer, to give you nailing positions for the plasterboard patches around the opening.

When you cut and fit the plasterboard patches, try to have a dead straight 'factory' edge where a patch meets an existing sheet of plasterboard. This will make stopping and levelling easier after you have nailed it on.

David Jordan

Build a serving hatch

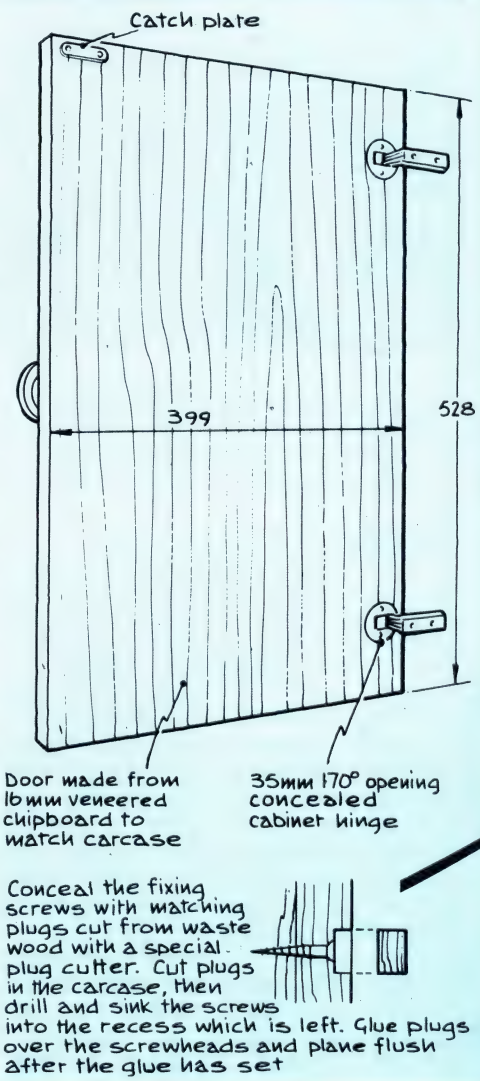
A hole in the wall can be easily and cheaply converted into a practical and attractive serving hatch.

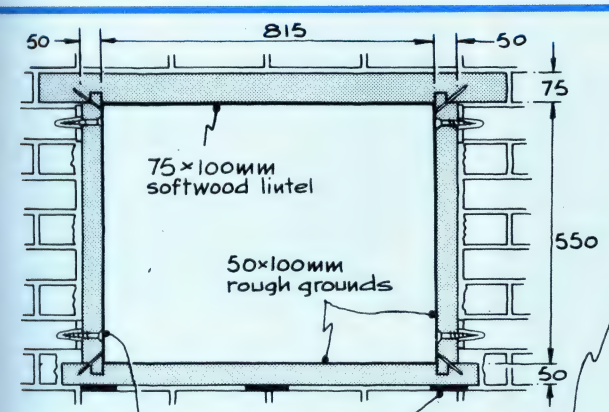
After knocking a suitable hole through the wall and inserting a lintel, make up an open box, or frame, which is a loose fit within the opening. Level this frame in the hole using wooden wedges. Check with a spirit level, then screw through the sides only—not the top and bottom too, or you may pull the box out of shape.

Fit a hardwood surround to give a neat appearance to the hatch, and hang the doors.

There are many alternatives to the basic design. For example, the hatch can be made without doors, or, for extra privacy, with doors on each side of the opening. The picture opposite shows how a fluorescent light has been recessed into the wall above the hatchway to add attraction to this area after mealtimes.

The dimensions and details given in the plans are suitable for a small kitchen hatch through a single brick wall. If your wall is thicker or thinner than that shown, the width of the boards forming the main carcase should be modified to suit. All other dimensions remain the same.


Catch plate
399
528
Door made from 18mm veneered chipboard to match carcase
35mm 170° opening concealed cabinet hinge
Conceal the fixing screws with matching plugs cut from waste wood with a special plug cutter. Cut plugs in the carcase, then drill and sink the screws into the recess which is left. Glue plugs over the screwheads and plane flush after the glue has set

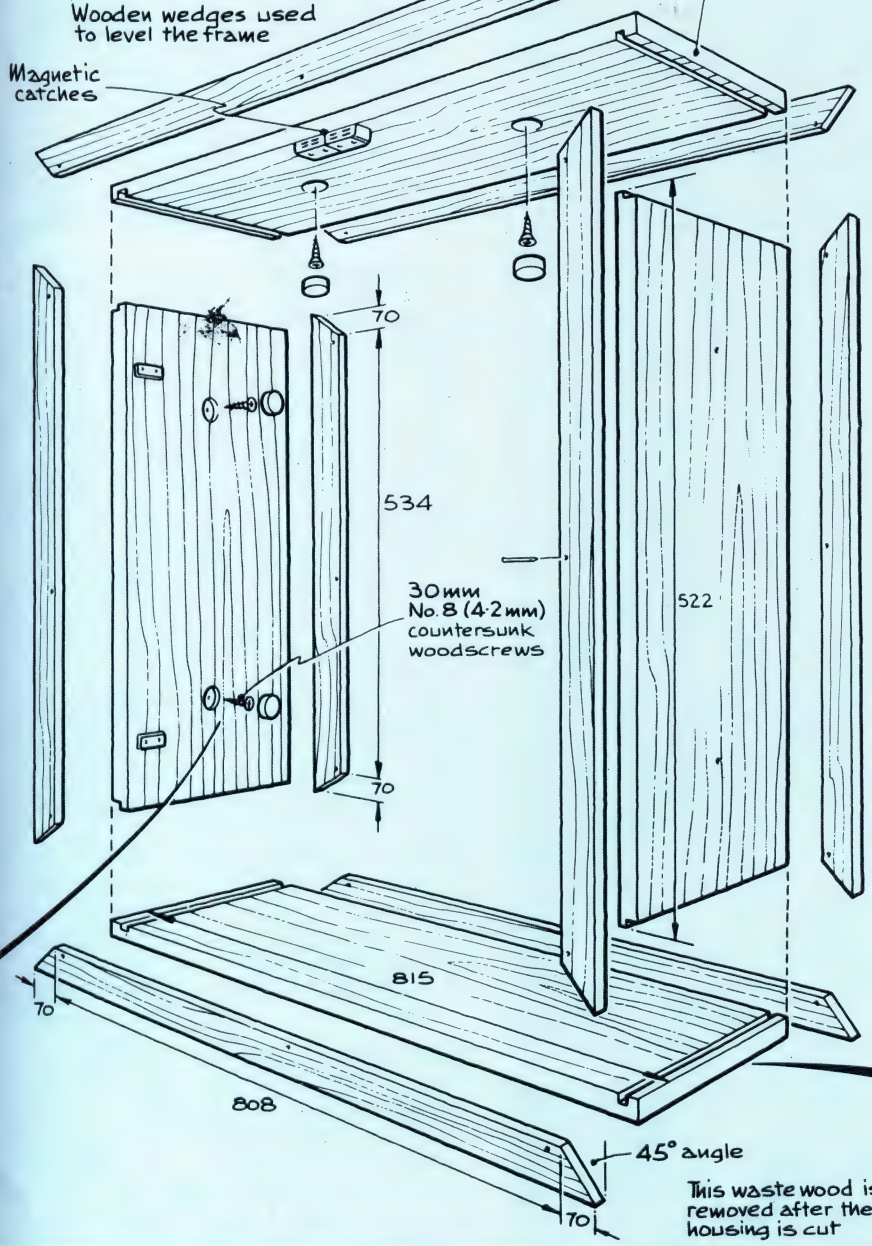


70×15mm planed all round hardwood architrave to match carcase. This is fixed to the carcase with 30mm panel pins punched below the surface and filled with matching filler

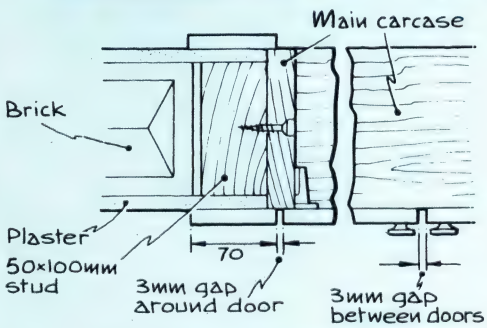
Make main carcase from 20mm thick solid planed all round timber. The width depends on the thickness of the wall

Wooden wedges used to level the frame

Magnetic catches



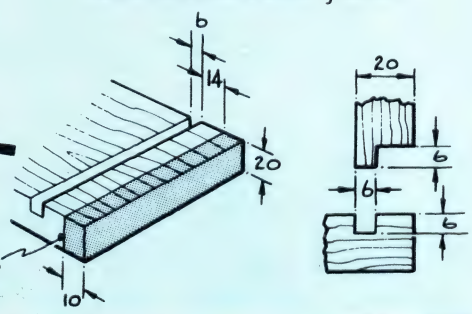
Electricity Council



Section through hatch opening

The carcase may be constructed from almost any timber, but a hardwood such as mahogany, sapele or utile is attractive and readily obtainable. Finish with two coats of cellulose brushing sanding sealer plus two coats of melamine or polyurethane clear lacquer

Main carcase corner joints



Advertising Arts

Simple security

The rules for securing your home against unwelcome intruders are quite simple. Make it difficult for the criminal to break in and he will go and look for easier pickings elsewhere

Nigel Messett

According to police, burglars fall into three basic categories. The professional thief who knows what he is after —valuables like antiques, jewellery, paintings and cash—likes to work quickly and cleanly.

The spur-of-the-moment sneak thief is the one who grabs at the chance of stealing ready cash and any easily transportable valuables if he sees a housewife pop next-door and leave the door open.

The third category is the young vandal, bent on causing as much damage as possible, who rips out telephone wires, slashes furniture and breaks everything he can lay his hands on.

Strong security locks on the doors and windows will deter the last two categories. Professional burglars are more difficult to stop, but if your house is going to be very difficult to break into, they will usually decide to try elsewhere.

Securing doors

Most front doors are fitted with a nightlatch, which normally presents little trouble for a thief. A far more effective deterrent is a mortise deadlock. The bolt on this is fixed dead when locked and cannot be sprung back like an ordinary nightlatch.

Mortise locks come in a wide range of shapes and sizes but not all are of a guaranteed quality. It is best to buy locks which have been tested by an independent standards organization.

A good quality mortise lock is designed to be stronger than any wooden door into which it is likely to be fitted. This means that the woodwork would fail before the lock itself. When it is locked, the bolt is enclosed in a steel box protecting the head of the bolt against possible attack from a jemmy or similar tool.

Good security locks cannot be opened with skeleton keys and it is virtually impossible to pick them as they incorporate an anti-picking device. The deadbolts are reinforced to frustrate any attempt to cut right through the bolt.

Left: *All you need to make a door burglar-proof. A mortise lock provides an effective deterrent to most burglars, being difficult to force, or pick open. Fitting one is a fairly simple procedure—you will need a drill, chisel, padsaw and screwdriver*

Nelson Hargreaves

1 *Use the lock body as a template to mark the position of the hole in the edge of the door. Follow the same procedure on the sides*

2 *With a marking gauge set to half the thickness of the door, scribe a line down the door edge to mark the positions of the drill holes*

3 *The drill holes should run almost together along the centre line on the door edge. This leaves you with a minimum of chiselling work*

4 *Use the chisel carefully, paring away only a small amount of wood at a time. Open out the holes into a perfect rectangle*

5 *Having chiselled out the rebate for the facing plate around the hole, use the lock body again to help mark the position of the keyhole*

6 *Form the cut-out section of the keyhole with a padsaw. Check the key for fit from both sides before you instal the lock body*

Fitting a mortise lock

When you buy a mortise lock you are supplied with several parts that have to be assembled in a certain order. The parts include the main lock body —inset into the edge of the door— a plate that is screwed over this to hold it in place, a striking plate and box that fits into the outer frame, screws, keys, and the keyhole covers.

Marking the position

The mortise lock can be placed at any height on the door, though a central position will obviously give the strongest fastening. When you have decided where to place it, take the lock body and use it as a template to mark the width and depth on both sides of the door. Remember that the facing piece of the lock is sunk approximately 6mm into the door so that the cover plate is flush with the surface of the edge.

Use a try-square to mark the width of the lock body on the edge of the door. Then, with a marking gauge, score a line down this width—to fall exactly in the middle of the depth of the door (fig. 2).

To make the hole for the mortise lock, drill, then chisel flat, four holes in the edge of the door. For this, you need a 19mm wood drill bit and a 19mm wood chisel. Wrap a short length of masking tape round the drill bit at the depth of the hole you require. When the holes are drilled, pare away the excess wood with the chisel, removing only small pieces at a time. Work progressively through the hole, making sure that the back surface is absolutely flat to avoid fitting problems later (figs. 3 and 4).

Chiselling out the rebate

Your next job is to chisel out the area into which the facing piece of the lock is inserted. A quick and easy way of doing this is to screw the cover plate in place and score carefully round it with a handyman's knife.

Unscrew and remove the plate then chisel out the area within the lines you have cut. You will probably find that you can score deeply enough with the knife to attain the depth of 6mm that you require. The neatness and accuracy of this chiselling is very much a matter of sleight of hand and eye, but be careful not to cut too vigorously or you may go too deep. When you have finished try the lock body and the cover plate in position and make sure the plate lies flush.

Cutting the key-holes

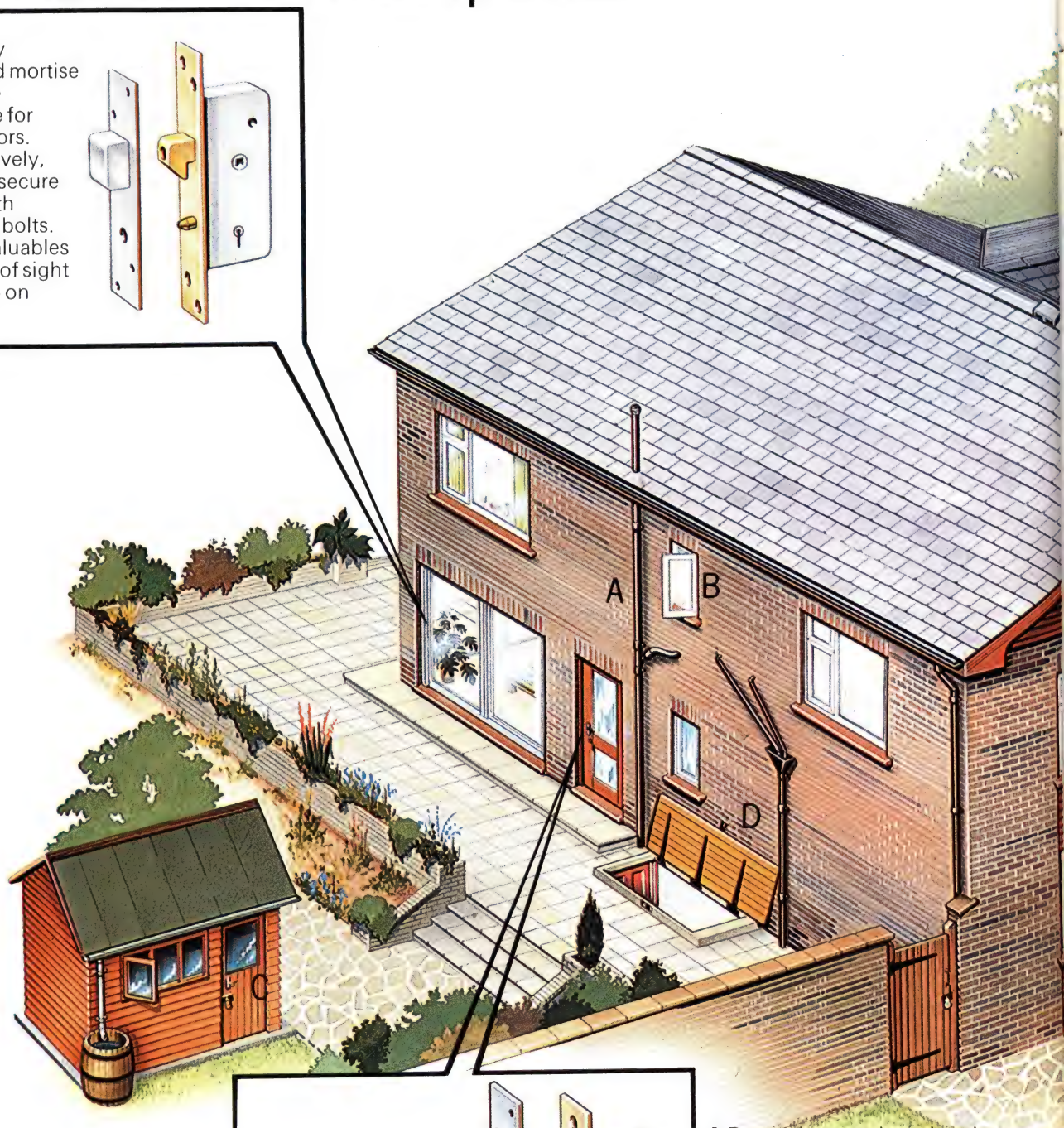
Hold the lock body in position against the lines you have marked on the side of the door then mark a central point for the key-hole by placing a scriber or small drill bit through it (fig. 5). Repeat this operation on the other side. You then require a 12mm drill bit to bore two holes through to the centre from either side of the door. You will be able to determine, with your particular key, the length of the downward cut that you need to make for the key shape. Cut out this shape with a padsaw (fig. 6). Again make sure that you do this on both sides.

Now you can place the mortise lock back into position and screw on the cover plate. Your last task on this part of the door is to fix the key-hole covers on to the holes you have cut in the sides. You are provided with two covers, one with swivelling plate attached and one without. The swivel attachment is for the prevention of draughts and is therefore fixed on the inside of the door.

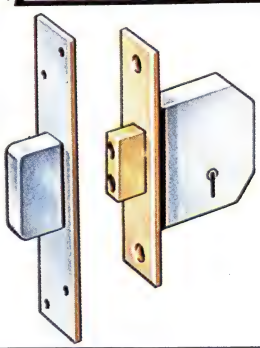
Mark the screw holes for these covers with the key comfortably set in the turning position. If you do not do it this way you may find you have key-fitting problems after the cover has been screwed in place.

Your house - the weak points

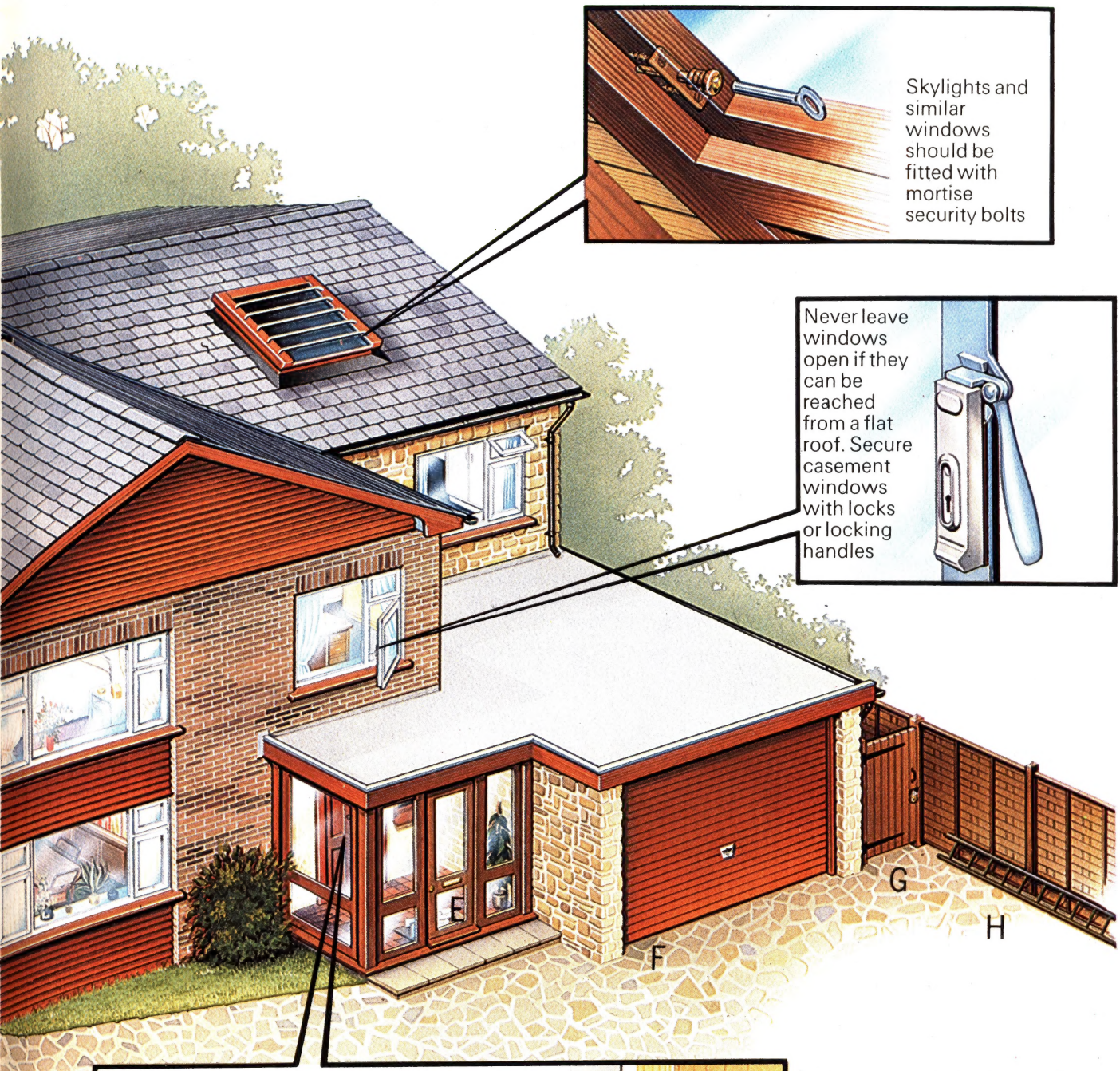
Specially designed mortise locks are available for patio doors. Alternatively, you can secure them with window bolts. Leave valuables well out of sight if you go on holiday



Thieves like back doors because they often have easily overcome locks. Secure them with at least a five-lever mortise deadlock

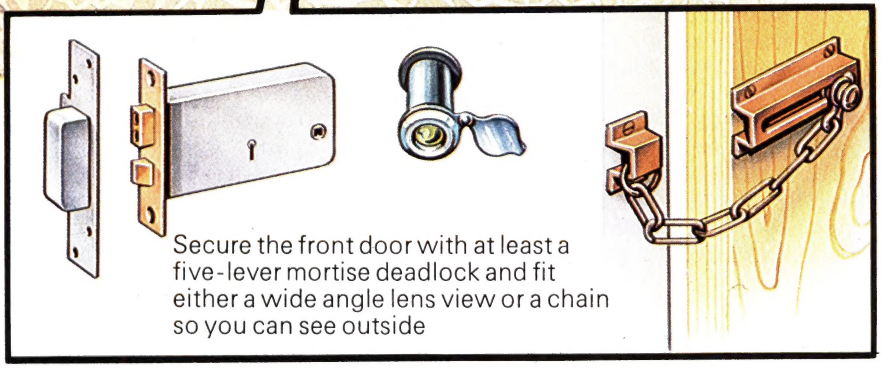


A Downpipes can be painted with anti-climb paint
B Small windows should not be ignored—thieves often use small children to climb through them
C Remember to padlock sheds and outhouses—some thieves specialize in outside things
D Make sure that basement doors and windows are secure—thieves work out of sight there



Skylights and similar windows should be fitted with mortise security bolts

Never leave windows open if they can be reached from a flat roof. Secure casement windows with locks or locking handles



Secure the front door with at least a five-lever mortise deadlock and fit either a wide angle lens view or a chain so you can see outside

E Never have a letter box on the door of a glazed porch—thieves will be able to tell you are away. Have the letter box on the front door and leave the porch open
F Never leave garage doors unlocked—thieves can enter unseen and remove bricks to get into the house
G Secure high gates with strong bolts or padlocks
H Never leave ladders lying around to tempt the burglar

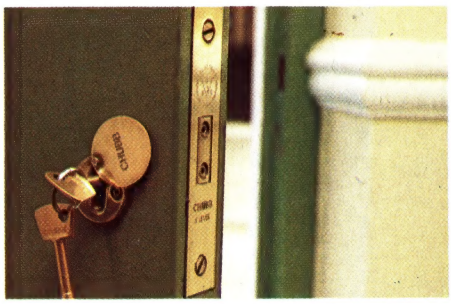
Venner Artists

7 *Having located the lock body in position and made any necessary adjustments to the depth of the rebate, screw on the cover plate*

8 *The only work left on the door itself is to fix the keyhole covers. Make sure the one with the draught cover goes on the inside*

9 *With the lock closed and held against the door frame, you can mark the depth of the striking plate rebate and bolt box*

10 *Cut out the hole for the bolt box and striking plate in the frame. Before securing the plate, make sure that the door will close properly*



11 *Both sides of the finished lock. The design is such that the woodwork around the door will fail before the lock itself*

12 *Key-operated casement window locks are simple security devices. To fit, first secure the shaft plate to the casement*

13 *The next step is to secure the locking plate on the window frame, making sure that it fits comfortably over the shaft plate*

14 *The window lock has a threaded barrel which screws onto the shaft plate. The barrel can be removed only with a special key*

Nelson Hargreaves

Fitting the striking plate

All that now remains is to fit the striking plate and bolt box onto the door frame.

To mark the position of the rebate, turn the key in the mortise lock so that the bolt protrudes in its locked position. Then close the door and, using the bolt as a guide, draw lines either side of it on the side of the door frame. Remember that the box that houses the bolt is wider than the bolt itself, so allow at least 3mm on either side of the bolt's width when you run these lines on to the inside of the door frame.

Next you must measure the length from the edge to the centre of the bolt on the lock body and translate this length on to the door frame, again using a marking gauge to scribe a central line on the wood.

It now remains to drill, as before, the box hole with two consecutively-placed holes (or three at the most) using the 19mm drill bit. This done, chisel and pare away the excess wood until the finished hole is formed.

It may not be necessary to make the striking plate flush with the level of the door frame's surface—it depends on how tightly the door fits in the frame. If it is a very close fit you must repeat the operation of screwing the plate into position, scoring round it and chiselling out a recess. If there is a gap where the door meets the frame, simply screw the striking plate into position. If, however, the screw holes on the striking plate are *plunged* —punched into a slight bowl-shaped recess—you may have to countersink the holes in the door frame slightly to allow for this.

Securing windows

Although the glass in windows always makes them vulnerable to straightforward breakage, an intruder will always search for a quieter method of entry first. Like the nightlatches on doors, most conventional window catches are surprisingly easy to force, so you need some extra security devices to act as a deterrent.

A number of lockable window catches are available, to suit all shapes and sizes of window. Figs 12 to 14 show how to fit one of these.

Once in place, window locks should deter all but the boldest intruder. But for the sake of safety in the event of a fire and for your own convenience, remember to leave the keys near the window. Choose an accessible site, but one out of a burglar's vision.

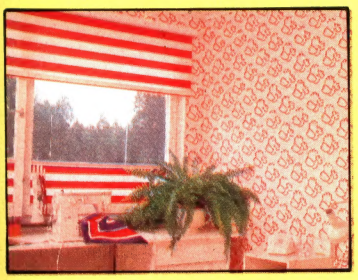
In next week's issue

Using a chisel. The safe and correct use of chisels is a woodworking skill that is well worth acquiring. When you've learnt how, you will be able to make the dainty trinket box we describe.

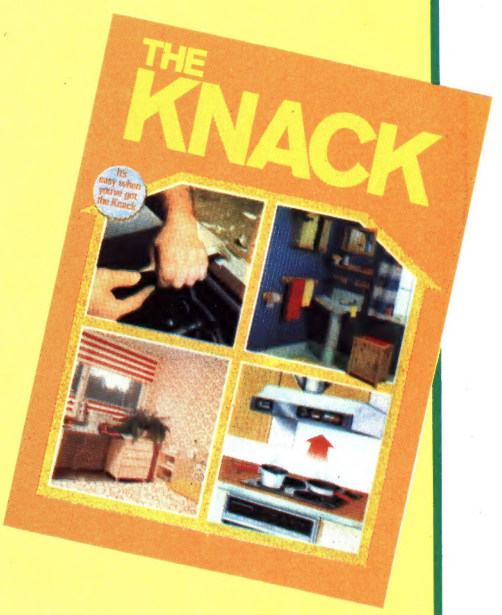
Pine bathroom accessories. Make a handy linen box in warm, natural wood to complement the accessories we introduced in Part 1. Also included: an easy-to-make mirror frame and towel rail.

Kitchen ventilation. Warm, moisture-laden kitchen air is more than unpleasant—it can play havoc with paint and wallpaper. We show how to calculate the necessary air-change requirements for your kitchen, and how to fit an extractor fan or over-stove extractor hood.

Understanding your water system. The layout of a house plumbing system, and the function of all the different pipes, valves and cisterns in it, is a mystery to many house-holders. But modern plumbing systems are relatively simple and logical. Learn how yours works and you could save on plumbing and repair bills.



Make the most of your windows. This imaginative feature shows you how you can transform any room—just by the careful use of curtains, blinds or shutters on the windows.



Be sure to get your copy

Where to buy it—UK

Bending copper pipe, Pages 197-202: Copperband flexible pipe from: UCAN Ltd., 11 Old Esher Road, Hersham, Surrrey.

On reflection, Pages 203-209: Sliding door mirrors from: Panavista Ltd., Fircroft Way, Edenbridge, Kent. Smoke glass panels from: Sekon Glassworks Ltd., Essian St., London E1.

Dig garden pond, Pages 210-213: All products except crazy paving from: Highlands Water Garden Nurseries Ltd., Solesbridge Lane, Chorleywood, Herts., and other large garden centres. Paving from larger builder's merchants.

Simple security, Pages 220-224:

Mortise Locks: Chubbs, 68 St James's St, London SW1A 1PH, will give advice on their lock centres throughout the UK.

Buying timber

Timber everywhere is sold in 'nominal' sizes. That is, the size quoted is not the size of the finished board you buy, but the approximate size of the rough-sawn timber from which the board has been machined.

Particularly when buying mixed materials for the same project, always take a ruler to the store and measure the actual widths and thicknesses.

Cutting lists

Because of varying widths and thicknesses, cutting lists can be accurate only to within a few mm.

So, when cutting materials for furniture and other close-tolerance projects—particularly if they are to be built-in and must occupy a fixed overall length—start by checking that the actual widths and thicknesses of your material actually correspond with those given in the diagrams.

Where to buy it—Australia

On reflection Pages 203-209:

Mirror tiles are available from specialist 'Home Decorator' shops. Acrylic plastic mirrors which you mount on chipboard yourself are obtainable from Cadillac Plastics who have branches in Sydney, Melbourne, Brisbane and Adelaide and Plastics Trading Co. who have branches in Sydney and Melbourne.

AUSTRALIA AND NEW ZEALAND–DIY LAW

Electricity

In Queensland and Western Australia, only a licensed electrician is authorized to do any electrical work of any kind.

In the other States and Territories of Australia and in New Zealand, an unlicensed person may work on flexible cables and on appliances which connect to a socket outlet.

In all parts of Australia and New Zealand, work by an unlicensed person on permanent wiring, or equipment which is permanently connected to the supply, is prohibited.

Plumbing and drainage

In all States of Australia and in New Zealand, only a licensed plumber or licensed drainer is authorized to alter, extend or repair household plumbing or drain lines.

Do-it-yourselfers can undertake some minor repairs. But since the laws vary from one State to another, consult your water authority first.

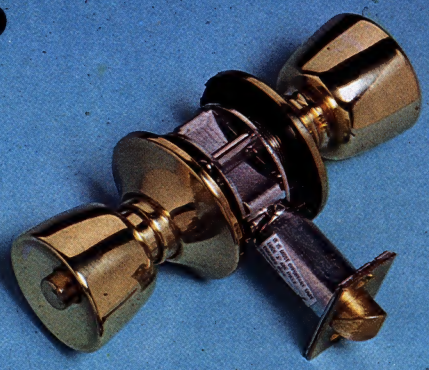
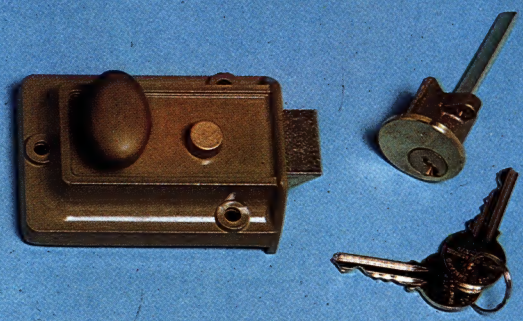
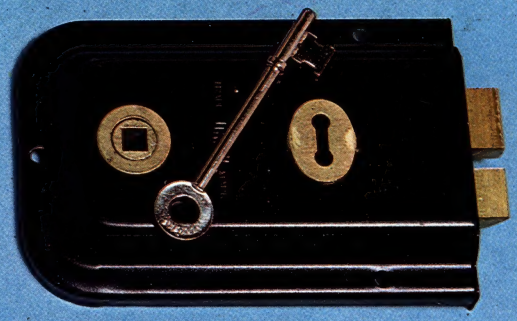
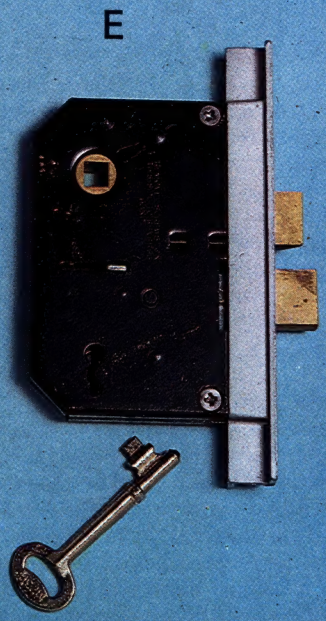
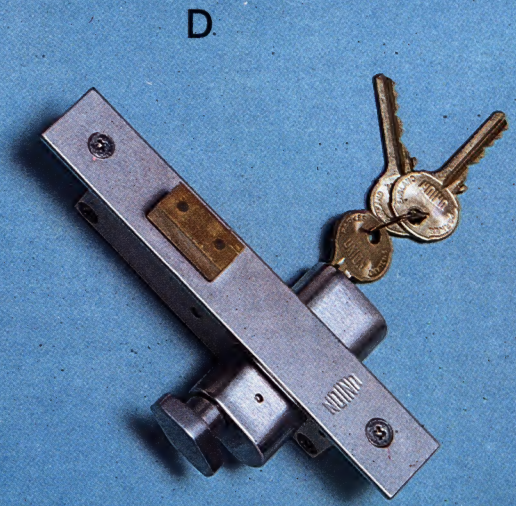
Exterior door locks

A. *Knobset. A combined knob and lock—the locking mechanism is in the centre of the handles. A knobset is easy to fit since the holes in the door do not need chiselling out*

B. *An ordinary nightlatch, fitted in countless houses. It is cheap and easy to fit, since it is mounted on the surface of the door. But it is no real deterrent to a thief*

C. *A simple rim latch and lock, mounted on the surface of a door. The square hole takes the shaft of the handle assembly, which operates the latch. This sort of lock does not offer much security—it can easily be picked*

D. *Cylinder mortise deadlock. This is recessed into the thickness of the door. The locking bolt can be fixed so that a burglar cannot spring it back like an ordinary nightlatch*

E. *A simple two lever lock and latch. This is rather more secure than the rim latch and lock shown at C. Because it is recessed into the door it is less obtrusive, too*

F. *A five lever mortise deadlock, secure enough for important external doors. Fitting this sort of lock is described on pages 220 to 224*